

Turkish public preferences for energy

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ABSTRACT

Public concern over energy supplies, prices, sustainability and efficiency has emerged as a major issue around the world. Yet most of what we know regarding public opinion on energy comes from North America and Europe. This paper presents the results from the 2016 Turkish Public Preferences for Energy Survey, which included 1204 respondents and examined Turkish residents' household energy consumption, energy policy preferences, and environmental concerns. The main findings were that Turkish citizens consider natural gas and electricity highly expensive, view dependence on imported energy as Turkey's most pressing energy challenge, and recognize the problem of climate change. This lends public support for wind and solar power, but, at the same time, energy issues and the environment policies of political parties do not affect voting choices and political preferences.

1. Introduction

Public preferences for energy and environmental issues have been an important area of energy studies. There is an extensive literature on public concerns, especially on socially disputed policies such as offshore drilling for oil and gas in the United States (Freudenburg, and Gramling, 1993), the development of unconventional hydrocarbons (Clarke et al., 2015), and nuclear energy (e.g., Corner et al., 2011; Poortinga et al., 2013; Bird et al., 2014; Kim et al., 2014; Siegrist et al., 2014; Wagner et al., 2016a, 2016b; Latré et al., 2017). However, most of our knowledge concerning citizens' evaluation of energy issues is drawn from studies on North American and European cases. Therefore, despite the existing literature, there is limited knowledge about energy perceptions and priorities of people outside of these contexts.

This article attempts to fill this gap by providing empirical evidence from Turkey by analyzing the findings of the Turkish Public Preferences for Energy Survey (TPPES) conducted by the Center for Energy and Sustainable Development in November 2016. The survey interviewed 1204 registered Turkish voters across 16 cities. Turkey offers an interesting case to study public opinion on energy issues. Its growing population, industrialization, and urbanization rates are accompanied by considerable and growing demands for accessible, sustainable and affordable energy. Turkey is also highly dependent on fossil-based energy imports, which negatively affect its national trade deficit, energy supply security, prices, and environmental conditions (Ediger and Akar, 2007; Demirbaş, 2001). In order to reduce import dependence, Turkey is developing three nuclear plants (Iseri et al., 2018), while a shift from

using fossil-based resources to renewables is an alternative policy (Ediger and Kentel, 1999). Studying public opinion and knowledge about energy problems will help policy-makers and stakeholders to pursue sensible policies that meet the demands and needs of the public. The public's amenability to energy policies is also considered vital for legislation to be successfully implemented (Lourenço and Costa, 2007; Nilsson et al., 2016). For instance, in the UK and a number of other European countries, the major obstacle to expanding the renewable sector is public opposition to the site selection of renewable-energy facilities and the up-front investment costs (West et al., 2010). In the United States, solar-energy technologies are considered unlikely to succeed in the marketplace without public support (Bolsen et al., 2016). For the case of new policies, such as German Energiewende (Energy Transition), which pose major challenges to all parties involved, understanding public preferences could contribute to resolving challenges in a more democratic way (Schweizer et al., 2016). Therefore, it is important for policy-makers in Turkey to develop an in-depth understanding of public preferences through polls to develop effective, acceptable and legitimate policies that will bring clean, sufficient and affordable energy.

This survey is not the first examination of Turkish attitudes towards energy issues, but it is unique compared to previous studies in at least three ways. First, it includes a broad range of questions relevant to individuals' use of energy, household energy consumption, opinion on the quality and cost of energy services, political preferences, level of knowledge on energy and environmental issues, information sources, and global energy concerns. Second, the sampling was designed to

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Table 1
Studies on public surveys on energy in Turkey from 1996 to the present.

No	Reference	Subject	Details
1	Biresselioglu et al. (2017)	Industry's perception of energy security	Exploration of nine suppositions related to several energy issues among the top 500 industrial companies in Turkey
2	Ulukavak-Harputlugil and Harputlugil (2016)	Consumer behavior of households on environmental issues and energy conservation	19 questions, 2578 households in large cities in Turkey
3	Emeç et al. (2015)	Energy poverty and energy preferences	Data from Turkish Statistical Institute
4	Erdil and Erbiyik (2015)	Renewable energy sources and Sustainability	40 energy experts among academicians and professionals working in the public and private sector
5	Yakut-İpeklioğlu et al. (2014)	Renewable-energy perception scale	16 questions, 85 university students
6	Yapraklı and Bayramoğlu (2014)	Biomass energy potential and its economic effect on TRA1 region	32 questions, 952 people
7	Sahin and Köksal (2014)	Electricity consumption and saving potential of households	A survey is made at 260 homes in Ankara
8	OKA (Middle Black Sea Development Agency) (2013)	A survey on R&D and innovation on renewable energy in TR83 region	A survey on perceptions of 128 employees from private and public sector, NGO's and universities
9	Okay-Toprak et al. (2013)	Consumer behavior in recycling of electrical and electronic waste	14 questions, 1092 end users in Istanbul
10	MoE- Republic of Turkey Ministry of Economy (2013)	Green buildings and international trade services	14 questions, 232 people from 18 different public and private institutions
11	Ertör-Akyazı et al. (2012)	Citizens' preferences about nuclear and renewable energy	Nine questions are asked to 2422 citizens who live in urban cities
12	Aydiner-Boylu and Yertutan (2012)	Men's domestic habitual and purchase-related energy and water-conservation behaviors	176 married men
13	ENVER (ENVER-Energy Efficiency Association) (2012)	Women's awareness of energy efficiency	2929 women in 20 cities
14	İBB-Istanbul Metropolitan Municipality (2012)	Energy efficiency in daily life	1124 participants from a seminar on energy efficiency
15	İSO-Istanbul Chamber of Industry (2013)	Energy efficiency	30 questions are asked to 262 different companies
16	Karatepe et al. (2012)	Awareness about renewable-energy sources	102 students from the department of electricity in three universities (Marmara University, Afyon Kocatepe University, and Düzce University)
17	TMMOB EMO-Chamber of Electrical Engineers Diyarbakır Branch (2012)	Problems in electricity and consumer behavior	80 questions to householders in Diyarbakır
18	Oz (2011)	Energy consumption behavior and its relationship with the environment	Households in Bursa
19	Karabulut et al. (2011)	Renewable-energy education at the university level	134 faculty members from 14 universities
20	Erbil (2011)	Social acceptance of the clean-energy concept	150 participants from different neighborhoods of Istanbul
21	Ediger and Kentmen (2010)	Social dimension of energy and energy choices of public	An investigation of Eurobarometer based on 1005 citizens between 2005 and 2006
22	Palabiyik et al. (2010)	Social acceptability of nuclear energy projects and analysis of public-refusal syndrome	9 questions, 1152 residents in Mersin, Sinop and Kırklareli.
24	Sever and Ulu-Kalin (2010)	Hydroelectric dams	5 open-ended questions are asked to 90 inhabitants of Artvin
25	MENR GDRE- Directorate of Renewable Energy (2010)	Energy efficiency among households	2531 people, 26 different cities
26	Celiktas and Koçar (2010)	Foresight on renewable energy	6 questions, 465 energy experts
27	Kılınç et al. (2009)	Incentives and disincentives for using renewable energy	26 questions, 155 students between the ages of 13 and 14
28	Kasapoğlu and Turan (2008)	Attitude-behavior relationship in environmental education	15 pairs of sentence scale assessed by 260 eight grade students in Ankara
29	Ozil et al. (2008)	Renewable energy and environmental awareness and opinion	15 questions, 748 students from engineering, business and management departments in Canada, Romania, and Turkey
30	Ozdemir and Çobanoğlu Omca (2008)	Prospective teachers' attitudes towards the use of nuclear energy	20 questions, 124 prospective teachers at Ondokuz Mayıs University
31	Parlak-Biçer and Özer (2008)	Heat insulation in corporate housing	139 middle-class residents in Kayseri
32	Erten (2002)	Energy-saving behavior at the homes of students	970 students from the seventh, eighth and ninth grade
33	Bobat (2000)	Akkuyu nuclear power plant	Five questions, 72 academicians in Mersin University
34	Karahan (1996)	Central-heating properties and geothermal energy	Different income groups living in 1500 houses and offices in Denizli

capture a nationally representative group of registered Turkish voters (18 years and older). Some previous surveys, including those by the General Directorate of Renewable Energy of Turkey (MENR GDRE, 2010), Istanbul Chamber of Industry (ISO, 2012), Istanbul Metropolitan Municipality (İBB, 2012), and Energy Efficiency Association (ENVER, 2012), measured how people perceive energy efficiency, productivity, and consumption. There have also been surveys on public views on renewable energy (Kılınç et al., 2009; Karabulut et al., 2011; Çeliktas and Kaçar, 2010; Erbil, 2011; Yakut-İpeklioğlu et al., 2014; Erdil and Erbiyik, 2015) and nuclear energy (Bobat, 2000; Özdemir and Çobanoğlu, 2008; Palabiyik et al., 2010; Ertör-Akyazı et al., 2012). These surveys, however, have either covered more specific areas relating to energy policies or used smaller, non-representative samples. Table 1 summarizes the their main areas of interests and sample characteristics from 1996 to present. Third, household energy

consumption is rising in Turkey but there are few studies on the topic. The most recent survey by the Turkish Statistical Institute (TSI) is now outdated and provides limited data on patterns in energy consumption (TSI, 1998). Our survey provides the most recent empirical evidence regarding residential energy consumption habits and preferences.

In this study, we introduce the results from TPPES and discuss how public preferences regarding energy and environmental issues are compatible with government policies in Turkey. The purpose of the paper is to provide a descriptive and exploratory analysis of this new and unique dataset. We also provide an in-depth comparison of our findings with those from other international surveys. We discuss to what extent and in what ways Turkish public attitudes towards energy differ from the Western countries.

We found that Turkish residents mostly use natural gas, coal and electricity for household consumption, but they view electricity and

natural gas prices as the most costly energy sources. In line with this, they favored the installation of renewable and natural gas plants over coal and nuclear plants. At the same time, public understanding about energy issues is low, energy is not amongst the important public concerns, and the energy and environment policies of political parties do not affect voting behavior.

The following article is structured as follows: [Section 2](#) is devoted to materials and methods. This section also includes an overview of the profile of survey participants. [Section 3](#) investigates energy consumption and preferences of households, while [Section 4](#) reveals public opinion about Turkey's energy policies. [Section 5](#) is devoted to energy and environment-related questions, and [Section 6](#) to comparisons and discussions. [Section 7](#) concludes.

2. Materials and methods

This survey used quantitative methods, as opposed to qualitative research, to determine the factors that inform public attitudes and viewed ‘the public’ and ‘public opinion’ as homogeneous wholes, as preferred by [West et al. \(2010\)](#). It was carried out in face-to-face interviews with participants from November 12–27, 2016. The target group was registered Turkish voters (+18 years old) and included 1204 people as a representative sample of the population. The respondents were selected based on probability-sampling methods, which is based on proportional to multi-stage, stratified, random, sampling method. In this method, all persons in the target population have a known chance of being interviewed, and it is expected that the views and opinions of the respondents mirror those of the voting population. In the sampling selection, districts were used for the metropolitan cities, while central and external area were used in the other cities for the second sampling units. Face-to-face interviews were conducted on the districts (urban interviews) and the villages (rural interviews) of the selected centers and external cities according to distribution of cities. More specifically, two streets from each location were selected using the random street selection table (RSST), taking alphabetical order into account. In each street, a household number was determined using a random household-selection table (RHST), while interviews were conducted with the person selected among the residents of the household. According to this selection process, the respondents hailed from 16 different cities, which are divided according to the statistical region units classification developed by the Turkey Statistical Institute that includes Adana (97), Ankara (28), Antalya (56), Bursa (112), Diyarbakır (88), Erzurum (35), Gaziantep (38), İstanbul (221), İzmir (66), Kayseri (61), Konya (37), Malatya (60), Manisa (90), Samsun (71), Tekirdağ (52), and Trabzon (41). The sampling error was calculated to be 2.82% at a 95% confidence level. Summary statistics of selected respondent characteristics are given in [Table 2](#).

The first ten questions sought to understand the profile of the respondents and show that they represent the whole population within a statistically valid confidence level. The respondents were 51% male and 49% female who fell within the following age ranges: 35–44 (25%), 25–34 (23%), 45–54 (22%), 18–24 (17%), and 55 + years old (12 +). A total of 70% of respondents were 24–54 years old. The education level of 34% of respondents was a high school degree, 37% was primary school or lower, and 15% middle school. In other words, 86% of respondents had at most graduated from high school. A total of 66% of respondents was married and 70% had children, of which 34% had two children, 23% three children, 21% one child, and the remaining 23% more than four children. Most worked full-time (68%), while 32% indicated that had never had a job, including housewives. The breakdown by total monthly household income was as follows: between 901 Turkish Lira (TL) and 1800 TL (36%), between 1801 TL and 2700 TL (24%), and between 2701 TL and 3600 TL (14%). Most (63%) owned their home, and lived as a family of four (28%), three (24%), and five (14%).

The respondents were asked 41 questions, of which 14 were related

to their energy consumption, five to their opinion and preferences as a consumer, 16 to Turkish energy policies, and six to global energy policies. The questions were prepared in order to answer the questions that people usually have when they are considering to accept new energy policies, as noted by [Schweizer et al. \(2016\)](#).

3. Energy consumption and household preferences

3.1. Survey responses related to energy consumption

The survey participants were asked several questions regarding their household energy consumption. One question pertained to the part of household energy use that required the largest expenditure, which was an easier measurement for people to understand than other quantitative energy units such as tons-of-oil-equivalents (Toe) or kilowatt-hours (kWh). According to the survey, Turkish households believe that they spend the most on heating (65.0%) and lighting (22.0%). Although transportation requires considerable energy consumption and expenditure, households do not consider it their largest expenditure (only 4.6%). According to [Eurostat \(2017\)](#), heating requires the most energy (64.7%) in 28 European Union (EU 28) countries, followed by lighting and appliances (13.9%), water heating (13.8%), and cooking (5.7%). In our survey, heating and lighting are followed by transportation (4.6%), cooling (4.2%), and water heating (2.0%). It should be noted that the figures for EU countries were for consumption amounts in 2015, not expenditure.

The results of the survey for household consumption of different energy sources are summarized in [Table 3](#). The most salient finding was that natural gas is used by over 50% of respondents as an energy source in home heating, water heating, and cooktops, which contrasts with EU 28 countries ([Eurostat, 2017](#)), where natural gas has a lower usage for space heating (42.3%), water heating (43.6%), and cooking (31.7%). In Turkey, coal is the second most used energy resource in home heating (24.9%), followed by wood (12.4%), but in EU 28 countries, coal use in space heating is much more limited (4.8%), and electricity is the top energy source used in ovens (82.5%) and second highest in water heating (26%). In EU 28 countries, cooking (49.9%) is mostly powered by electricity, followed by water heating (19.9%). In Turkey, natural gas (48.8%) and LPG (propane & butane mix) (43.3%) predominate for cooktops. Solar energy is only used in water heating with a small percentage (11.5%). Turkey used renewable energy in household consumption at a much lower rate than in EU 28 countries (22.6% in space heating, 10.4% in water heating, and 4.9% in cooking).

Respondents were then asked which energy source they spend the most for each month and how much they paid. The results are summarized in [Table 4](#), and the highest percentages are depicted in bold. Electricity and natural gas have the highest monthly bills (50.1% and 38.7%, respectively). Monthly bills for electricity were more moderate (100–150 TL) than for natural gas and petroleum products (> 200 TL).

In response to whether peoples' homes had thermal insulation, respondents were 34.2% affirmative and 65.2% negative. There was a roughly 17% increase in thermal insulation in housing compared to a 2010 survey by the MENR-GDRE, in which 17.3% answered affirmatively and 74.8% negatively (2010). This increase can be attributed to government policies and progress in setting up legal frameworks for encouraging energy efficiency in the building sector. According to the MENR Energy Efficiency Action Plan 2012–2023, the government aimed in 2010 to transform 25% of buildings in Turkey into “sustainable” buildings (e.g., including thermal insulation, energy efficient heating systems and maximum emission limits) by 2023 ([MENR, 2012](#)). Yet there is still significant potential for greater energy-efficiency savings in households according to a World Bank report ([Akçollu et al., 2015](#)), which found that 7.1 Mtoe of savings (out of a total potential savings of 16.5 Mtoe) relative to 2009 and, in terms of monetary value, 5.8 billion Euro (€) of savings (out of a total potential savings of 13.2 billion €), could still be realized. We also compared thermal insulation

Table 2
Summary statistics of selected respondent characteristics.

	No. of respondents	Percentage (%)		No. of respondents	Percentage (%)
Sex			Marital status		
Male	614	51	Married	800	66.4
Female	590	49	Single	320	26.6
			Other	84	7
Age			Income		
18–24	208	17.3	0 - 900 TL	55	5.3
25–34	282	23.4	901 - 1800 TL	432	41.6
35–44	299	24.9	1801 - 2700 TL	285	27.4
45–54	266	22.1	2701 - 3600 TL	171	16.5
55–64	109	9	3601 - 4500 TL	49	4.7
65 +	38	3.2	4500 TL or more	46	4.4
Education			House ownership		
Primary school degree or less	441	36.7	Yes	761	63.2
Middle school degree	183	15.2	No (rent)	401	33.3
High school degree	411	34.2	Other	42	3.5
University degree or more	167	13.9			
Settlement			Employment status		
Urban	933	77.5	Employed	570	47.3
Rural	271	22.5	Unemployed	436	36.2
			Retired	108	9
			Student	90	7.5
Total	1204	100	Total	1204	100

Table 3
“Which energy source do you use for home heating/water heating/cooktops/oven?”.

Energy Source	Home Heating	Water Heating	Cooktop	Oven
Natural gas	53.7%	51.8%	48.8%	6.8%
Coal	24.9%	3.5%	N/A	N/A
Wood	12.4%	4.0%	0.6%	0.8%
Electricity	8.6%	26.0%	7.1%	82.5%
Solar	N/A	11.5%	N/A	N/A
Oil & petroleum products	N/A	1.4%	43.3% ^a	6.9% ^a
Other	0.4%	1.8%	0.1%	N/A
Total	100%	100%	100%	100%

^a LPG: propane & butane mix.

in housing by region, household-income level, and education level and found that thermal insulation levels increase with higher incomes and education levels. It was also noteworthy that households in regions with warmer climates such as the Aegean, Mediterranean and southern Anatolian regions require less thermal insulation.

The question of “the extent to which energy efficiency is applied” received a response of about 65% affirmative (moderate + more + quite more). This indicates that there is awareness among individuals about the importance of energy efficiency, and that there is considerable potential (35%) for improvement in this area.

The capacity margins for electricity-supply security have improved since 2009 (69% in 2014). Yet electricity-supply security remains elusive due to rising energy demand, an aging transmission network, the

presence of old conventional generation plants (especially fuelled by lignite and coal), and the lack of adequate baseload power generation (e.g., nuclear). The severe power outage in March 2015 across Turkey – the first since the blackout following the 1999 earthquake – was a warning sign. The majority of households (46.9%) experience outages infrequently (e.g., a few in a year) outside of major events, whereas the share of occasional (e.g., a few in a month) and frequent (e.g., a few in a week) outages are 26.9% and 13.3%, respectively.

According to the question related to car ownership and its fuel type, 59.1% of respondents do not own a car and only use public transportation. Car owners used diesel (16.8%), LPG (12.2%), and gasoline (11.8%) as fuel. The average monthly fuel expenses were 100–200 TL (24.9%), 200–300 TL (21.0%), 300–400 TL (14.3%), and above 400 TL (14.9%). This matched the data collected by TSI in October 2016 (TSI, 2016). According to the IEA (2016b), fuel prices in Turkey, which have an average tax of 50%, are higher than the average of IEA member countries, and are the eleventh-highest after the United Kingdom and South Korea. For the average monthly fuel expense, one third of households pay over 300 TL.

3.2. Household preferences on energy issues

This section summarizes the consumer preferences of the Turkish public. The respondents were asked: “Given similar costs and ease of accessibility, which energy source would you prefer to use at home?” Natural gas, solar and wind energy were the most preferred energy sources in households (62.5%, 21.0%, and 6.2% respectively). Other options were less than 2.3%. When compared to current energy

Table 4
Crosstab of “For which energy source do you pay the most?” vs. “How much is your monthly bill for this (the most paid) source?”.

For which energy source do you pay the most?	How much is your monthly bill for this (the most paid) source?						
	< 50 TL	50–100 TL	100–150 TL	150–200 TL	> 200 TL	Don't know / No response	Share
Electricity	2.8%	30.9%	33.4%	18.0%	13.9%	1.0%	50.1%
Natural gas	0.4%	4.7%	24.5%	20.9%	48.4%	1.1%	38.7%
Coal	0.0%	26.6%	34.2%	10.1%	27.9%	1.3%	6.4%
Wood	0.0%	43.6%	30.8%	7.7%	15.4%	2.6%	3.1%
Petroleum products	0.0%	8.3%	8.3%	8.3%	75.0%	0.0%	1.0%
Other	0.0%	22.2%	22.2%	0.0%	55.6%	0.0%	0.8%
Share	1.6%	20.6%	29.6%	18.0%	29.1%	1.2%	100%

consumption in terms of payments, natural gas and electricity (generated mostly from natural gas) preferences were in line with actual consumption levels. According to the MENR data (2015) on energy consumption in the housing and services sectors, the share of electricity is 33%, natural gas 26%, coal 11%, wood 9%, biomass 5%, geothermal 3%, petroleum products 3%, and solar 2%.

Although the results of Eurobarometer 65.3 (EB, 2006) revealed that Europeans were widely supportive of expanding the use of both solar and wind energy, the Turkish public preferred natural gas. This preference can be mainly attributed to the ease of use, established usage habits, and the perception that natural gas is a “clean energy source.” Although there is strong interest from investors and large potential for generating wind and solar power, consistent, long-term targets (beyond 2030 goals) and supporting regulations are required for investments in renewable-energy technologies, both in distributed generation and in the distribution and transmission grid, to be realized.

Most households considered electricity and natural gas prices either high or very high (88.0% and 85.6%, respectively). This is consistent with the results from EB (2006), in which the majority of Europeans (33%) mentioned high prices as their top concern for energy-related issues. Yet it is noteworthy that 20.3% of the households were unaware of the price for natural gas. Also, households that perceived that they paid the most for electricity did not consider the natural gas prices high or very high (46.9%). Household electricity prices have been trending downward since 2012, whereas gas prices have been more stable, despite the growing demand for natural gas (around 50 billion m³ (bcm) in 2016). The regulated household tariffs for both electricity and gas were the main reasons that prevent a fully cost-reflective tariff system that can react to high seasonality.

Turkish households' perception of electricity prices is similar compared to the most recent Eurostat data (2016b). Turkey has the seventh most expensive prices after Portugal, Germany, Belgium, Spain, Romania, and Poland, among 31 countries, based on purchasing power standard €/kWh half-yearly electricity prices in July–December 2016. Yet this is not the case for natural gas prices. The average household natural gas prices in Turkey are among the cheapest, ranking 23rd among the 31 countries. The main reason for low natural gas prices is that gas-distribution companies are obligated to provide low prices with tight or no profit margins.

Household perceptions about all dimensions of energy security were given a high or very high level of importance (between 91% and 98%), where the most important energy security dimension was affordability (41.6%). This is also supported by perceptions about high electricity and natural gas prices (see Table 5). Other concerns were quality (17.1%), clean and environmental friendly supply (14.0%), local supply availability (11.5%), and uninterrupted supply (10.2%). The level of importance assigned to affordability in Turkey is slightly higher when compared to EU countries (33%) (EB, 2006).

4. Energy policies of Turkey

As demand for and consumption of energy increases rapidly in Turkey, people should be more concerned about energy issues and policies, but, regardless of culture and education level, they do not have

Table 5
“In your opinion, which one is the most important?”.

Dimensions of energy security	% level of importance
Affordability	41.6%
Quality	17.1%
Clean & environmentally friendly	14.0%
Local supply availability	11.5%
Uninterrupted supply	10.2%
Don't know / No response	5.6%
Total	100.0%

sufficient awareness and knowledge about energy and environment-related issues (Karatepe et al., 2012). According to our survey results, this lack of awareness holds true for energy policies also. Information on energy issues is obtained from television, the Internet, and social media, which underscores its unreliability. Also, the lack of knowledge about energy policies implies that energy is not amongst Turkish society's important issues.

Television is the primary source of information on energy issues for the Turkish public (65.1% responded as the first answer and 81.0% as the second one), while internet/social media was second (12.7% responded as the first answer and 36.5% as the second one). In the MENR GDRE survey (2010), 57.8% of the respondents used television as the primary source of information on energy issues, followed by newspapers (23.1%). This shows that there is an increase in the use of television and internet/social media as information sources on energy issues, and a corresponding decrease in newspapers.

We asked respondents which political party they voted for and if they took into consideration the energy policies of the party that they have voted for. The majority of the respondents (38.0%) stated that they did not consider energy policies at all when voting. On the other hand, 47% of the respondents answered the question, “At which level do you consider environmental policies when you are voting?” as “rarely” or “never.”

In response to the survey question, “What are Turkey's most important problems?”, respondents ranked energy as the ninth most important problem (12.4%), whereas education, local security, and economy were the top three responses (between 46% and 48%). On the other hand, respondents identified dependence on imported energy (38.6%) and high prices (30.8%) as the most important problem of the Turkish energy system. Other problems were low quality of energy (4.1%), insufficient use of renewables (3.6%), inefficient use of energy (3.3%), work safety (3.0%), and others, all less than 5%.

Another issue that was investigated were government policies towards various energy issues. The highest negative answers (very poor and poor) were given for energy prices (53.3%), energy efficiency and conservation (34.5%), and nuclear energy (30.8%), whereas the highest positive answers (good and very good) were for oil and gas pipelines (54.5%), natural gas supply (53.9%), and electricity generation-transmission-distribution (51.4%). As far as the difference between positive and negative answers are concerned, oil and gas pipelines (+38.7%), natural gas supply (+36.4%), and electricity generation-transmission-distribution (+31.9%) had positive responses, whereas energy prices (−30.5%) had negative responses. Nuclear energy (−0.6%) and energy efficiency and conservation (+0.3%) had neutral responses.

Public support for policies on oil and gas pipelines as well as natural gas supply are in accordance with the government plans. BOTAŞ expects its maximum gas supply capacity to almost double from 2017 to 2023, as new projects come on stream (e.g., TANAP, TurkStream and additional storage capacity) (BOTAŞ, 2018).

Narrowing the question to specific government policy issues and how respondents viewed them provides insight into their support for particular political parties. In a typical distribution shown in Fig. 1 for the issue of “petroleum and natural gas pipelines,” most people who voted for AKP consider the government's policies as good or very good, followed by MHP, CHP, and HDP voters. On the contrary, the highest percentages of poor or very poor responses were from HDP voters, followed by CHP, MHP, and AKP voters.

Although respondents approved of government policies on petroleum and natural gas pipelines, 86% of them were unaware of the Turkish Stream project, which is one of the two most important natural gas pipeline projects in Turkey. This is a typical paradox of voter behavior.

The respondents were also asked from which countries they preferred Turkey to import energy. The top two responses were Azerbaijan (42%) and the Russian Federation (20%), followed by Iran (6%), Saudi Arabia (4%), and Iraq (3%). The actual level of imports and public

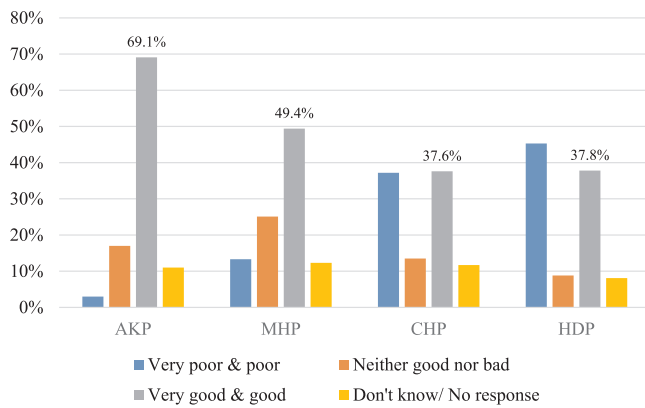


Fig. 1. Responses to government's petroleum and natural gas pipeline policy.

preferences were not quite aligned with these results. The public preferred countries that have good relations with Turkey, without considering the volume or extent of current energy trade.

5. Energy & environment-related survey questions

Respondents were asked which of the following statements best describes the concept of sustainability. The correct statement, “an institution or a country operating by considering the environment and future generations” received the highest response (40.6%), but incorrect statements were higher in total, i.e., “continuous existence of an institution or a country” (20.2%), “use of the latest technologies by an institution or a country” (13.5%), and “continuous increase in the income of an institution or a country” (13.5%).

The World Commission on Environment and Development (WCED, 1987) defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Another definition comes from the Encyclopedia of Life Support Systems (UNESCO, 2002): “the wise use of resources through critical attention to policy, social, economic, technological, and ecological management of natural and human engineered capital so as to promote innovations that assure a higher degree of human needs fulfilment, or life support, across all regions of the world, while at the same time ensuring intergenerational equity.”

Based on these definitions, our survey showed that the public broadly understood the concept of sustainability. Respondents recognized that the environmental impact from energy is greater than other sources. They believed that climate change/global warming, scarce energy resources, poor energy policies, energy supply security, high/volatile energy prices and energy efficiency/efficient use of energy are all important issues. Among these, climate change/global warming had the highest positive response (91.3%). The next three highest positive responses were for high/volatile energy prices (90.4%), scarce energy resources (88.5%) and energy efficiency/efficient use of energy (88.5%). The Eurobarometer 83.4 survey (EB, 2015) asked EU citizens about climate change and, similar to our results, 91% viewed climate change as a serious problem. Activities that continuously damage the environment are unsustainable, and the environmental impact of energy use requires special attention since a large portion of the impact on the environment is energy-related. Our survey supported the claim that energy sources with little or no environmental impact, such as renewable energy sources, need to be privileged for sustainable development (Rosen and Dinçer, 2001).

The majority of respondents (78%) believed in climate change. This outcome can be considered high for a developing country such as Turkey. In the United States, only 48% of the public believed that the Earth is warming due to human activity in a survey conducted by Pew Research (2016). In accordance with our survey results on climate change, government action plans envisage reductions in CO₂ emissions

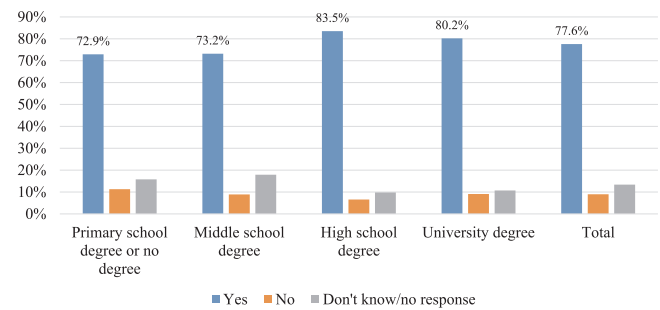


Fig. 2. Do you believe in climate change? vs. education level.

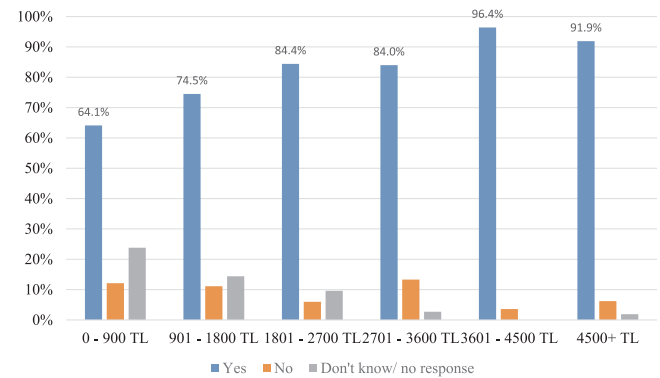


Fig. 3. Do you believe in climate change? vs. income level.

in energy, industrial, transport, waste and agriculture sectors according to the Climate Change Strategy 2010–2023 by the Ministry of Environment and Urban Planning (MEUP, 2010)

The survey also examined how education level, income, political choices, and geographic regions affected peoples' belief in climate change. Higher education and income levels are correlated with higher beliefs in climate change (Figs. 2 and 3). Belief in climate change is also higher among CHP voters compared to those of MHP, AKP and HDP. In addition, it is highest in northwestern Turkey and lowest in south-eastern Turkey.

Respondents recognized that energy (78.9%) is a major contributor to global warming, and urbanization (85.4%), industry (76.9%) and natural causes (46.1%) are all seen as significant sources of global warming. On the other hand, agriculture and livestock farming are not considered significant contributors, even though the IPCC (2014) report states that agriculture, forestry, and other natural land use contribute roughly 24% of global gas emissions. Similar to our survey results, JRC Policy Report stated that energy (i.e., fossil fuel usage) accounted for the majority of greenhouse gas emissions (85%) and was one of the main causes of climate change (Olivier et al., 2016).

In a different environment-related survey question, air pollution (41%) was considered the most important energy-related environmental problem in Turkey, followed by human health (20%) and climate change (17%). The destruction of vegetation (6%), the destruction of earth surface (5%), and water pollution (4%) were seen as less important. It is noteworthy that respondents considered energy-related air pollution a more important problem than energy-related climate change.

Public opinion about what energy source will prevail in the future focused on solar (40%) and natural gas (22%), followed by nuclear (7%), wind (7%), oil (7%), hydroelectricity (4%), geothermal (3%), boron (2%), and coal (1%). A similar question in the previous section, “Given similar costs and ease of accessibility, which energy source would you prefer to use at home?,” had a similar response, namely natural gas (63%) and solar (21%). Due to the fact that water heating by solar energy is widely available in Turkey and the unit price of

Table 6

“How much do you agree or disagree with installation of different types of power plant in your neighborhood?”.

Power plant type	Total disagree (%)	Total agree (%)
Nuclear power plant	49,6	26,6
Hydroelectric power plant	24,6	50,4
Solar power plant	3,0	86,0
Wind power plant	2,4	86,2
Bioenergy power plant	12,9	50,1
Coal power plant	45,8	26,5
Natural gas power plant	9,3	68,8
Geothermal power plant	11,5	58,2

photovoltaics has been decreasing over time, a majority of respondents (40%) envision that solar energy will be the most significant energy source in the future. Natural gas, which has well developed distribution networks and is widely used for heating in Turkey, was the second most popular choice.

Respondents also answered questions about the installation of different types of power plants in their neighborhoods (Table 6). They favored the installation of renewable and natural gas plants over coal and nuclear plants, with the highest positive responses for wind and solar plants (86.2% and 86.0%, respectively). The third highest positive response was for natural gas plants (68.8%), while coal and nuclear plants were less favored (50.4% and 54.2%, respectively). A similar result was obtained in earlier studies conducted by Bobat (2000) and Ertör-Akyazı et al. (2012). In Bobat (2000), respondents were 90.3% negative regarding the question “Should Turkey start utilizing nuclear energy?” Ertör-Akyazı et al. (2012) observed that the highest approval for investments was in renewables and natural gas but the lowest was for coal and nuclear. The results of EB (2006) also revealed the willingness of Europeans to use solar and wind energy (80% and 71%, respectively).

Public opinion about new nuclear power plants is correlated mostly with political party preferences. Opposition to nuclear energy power plants is higher among HDP voters (73% strongly disagree or disagree) than other political party voters (e.g., 38% AKP voters strongly disagree or disagree).

Survey questions related to fossil fuels yielded mixed responses. Respondents thought that fossil fuels, especially locally sourced ones, should be utilized as much as possible (67.7% for natural gas and oil exploration), but also that renewables are an important alternative and a fossil-to-renewable transition is necessary (73%). The Eurobarometer 65.3 survey (EB, 2006) asked whether Europeans supported the use of coal in their country, and only 26% of Europeans supported coal, indicating low support for fossil fuels.

Respondents also mostly supported the development of nuclear energy (52.8% for nuclear energy to decrease energy-import dependency and prices) and domestic nuclear energy technology (56.1%). Yet most opposed the installation of new nuclear power plants in their own provinces (50.0%). The two provinces that were the least opposed were Bursa and Konya, which supported such plants so long as they were constructed in accordance with environmental and human health regulations. The Eurobarometer 65.3 survey (EB, 2006) showed that 37% of Europeans opposed the use of nuclear energy, similar to our survey results (39.9%).

Government policies related to renewable energy seek to increase the use of hydro, solar, wind and geothermal resources from 13.92% of total primary energy supply in 2013–20.47% in 2023. According to the MENR Renewable Energy Action Plan (MENR, 2014a). The Turkish power sector accordingly seeks to increase renewable-energy capacity to 34 GW from hydro, 20 GW from wind, 5 GW from solar, 1 GW from biomass and 1 GW from geothermal resources (share of renewables from 40.0% in 2013 to 48.8% by 2023). Furthermore, the government has designed a policy mechanism to accelerate renewable energy

investments, called Renewable Energy Resource Areas (YEKA) project. YEKA provides affordable electricity generation via feed-in-tariff, a certain rate of domestication in renewable energy technologies and a long-term purchasing guarantee (10–15 years). Recently, two YEKA tenders have resulted in 1-GW wind and 1-GW solar energy investments in 2017. In addition, the government has announced new legislation for solar PV roof-tops that will enable residential customers to install solar panels with a maximum capacity of 10 MW and less bureaucratic obstacles. This indicates that government policies on renewable energy (especially wind and solar) are in line with public energy preferences. On the other hand, 9.2 GW of baseload power capacity is planned from nuclear energy (from the Akkuyu and Sinop plants), despite considerable public opposition (50%) to new nuclear power plants in their own provinces.

According to the MENR Strategic Plan 2015–2019 (MENR, 2014b), Turkey is projected to use lignite and hard coal resources at their full potential and to increase the domestic coal-fired power capacity to 60 TWh by 2019 in order to reduce dependency on energy imports, which was the top public concern about energy (39%). Furthermore, legislation in 2016 passed to promote indigenous energy resources (e.g., local lignite and/or coal-fired generation), but this is not in line with public preferences (a 44% opposition to coal generation in our survey).

The relationship between the level of environmental concern and support/opposition for the construction of new nuclear energy power plants was also observed in the survey. Our analysis showed that survey respondents who believed/did not believe in the existence of climate change supported less/greater installation of new nuclear power plants. In fact, support/opposition for new nuclear power plants was 16% more/less among climate-change deniers than climate-change believers, respectively. A similar trend was also observed in an earlier study conducted by Ertör-Akyazı et al. (2012), while a survey on environmental issues conducted in 32 countries by International Social Survey Program (ISSP) demonstrated that respondents considered nuclear power plants as extremely dangerous (31%), very dangerous (27%), and somewhat dangerous (22%) for the environment (ISSP, 2012). The ISSP survey in 2010 further showed that, in Turkey, 52% of respondents considered nuclear power plants extremely dangerous, almost 33% very dangerous, 10% somewhat dangerous, 4.3% not very dangerous and 0.6% not dangerous at all for the environment.

6. Comparisons and discussions

In this section we compare the Eurobarometer (EB) results for Europe and Turkey (if available) with that of our survey to identify similarities and differences in findings. The EB included a wide range of questions on three main energy themes: (1) public perception of energy issues, (2) attitudes toward the use of fossil fuels and renewable energy, and (3) demands from the government and EU regarding energy. We need to note that EB surveys asked many of the energy questions only in member states, excluding Turkey and other candidate countries from the survey sample. Therefore, the EB survey series provides an incomplete picture of Turkish public opinion on energy.

6.1. Public perception of energy issues

The recent results from the Eurobarometer 86 survey (EB, 2016) showed that only around 7% of Europeans believed that environment, climate and energy issues together were among the top two national problems. It also revealed that, similar to the results for the EU citizens, only 4% of Turkish respondents thought environment, climate, and energy issues were among Turkey's top two concerns. In our survey, however, a larger percentage of individuals (12.4%) stated that energy was among the three most important issues in Turkey. The difference between the results of these two surveys might be due to the wording of the questions, since the Eurobarometer 86 asked not only about energy

but also about the environment and climate. Nevertheless, similar to our findings, the EB 86 showed that Turkish respondents thought that energy was less of a concern than the majority of other policy areas, including security, unemployment, and the education system.

Besides receiving little attention from citizens, energy has mostly negative associations. Results from the Eurobarometer 65.3 (EB, 2006) revealed that when asked to think about energy, the majority of Europeans (33%) mentioned high prices as the first thing that came to their minds, and energy costs were the top concern in 18 of 25 EU member states. Europeans anticipated that energy prices would multiply by two or more times in the near future, which constituted the biggest threat. The Eurobarometer 65.3 (EB, 2006) showed that a large share of respondents (76%) believed that energy prices were likely to increase in three years.

Similarly, in our survey, we asked respondents their thoughts on the most important problem of Turkish energy system. As was the case for Europeans, high prices were a major concern for Turkish respondents, with almost 31% complaining about the cost of energy, but energy dependency on imports received the largest number of responses (almost 39%). This is an expected finding as the Eurostat (2016a) data showed that Turkey's dependency rate was almost 75% in 2014.

Despite the negative image of energy issues in Europe, EB (2006) revealed that Europeans were not particularly worried about future threats related to energy. When asked about whether a national electricity blackout might happen in their country in the next three years, only 36% of respondents said “very likely” or “somewhat likely.” More than half of European citizens (58%) reported that it was unlikely or very unlikely that a blackout would happen. The percentage of those concerned about an electricity crisis was highest in Italy (70%), likely because of the general blackout experienced in Italy in 2003 that affected 60 million people (Corsi and Sabelli, 2004). In our survey, electricity blackouts seem to be less frequent, as 47% of respondents reported that they experience outages only a few times a year.

6.2. Public attitudes toward the use of fossil fuels and renewable energy

Regarding public assessment of energy sources, the Eurobarometer 65.3 (EB, 2006) asked whether Europeans support the use of coal in their country, and only 26% of Europeans supported coal. Our survey had a similar question with a different wording. We asked to what extent respondents agree with the statement that coal production and consumption should be increased in Turkey, despite its environmental consequences. Those who chose the response categories “totally agree” and “agree” constituted 31.8% of all respondents, exceeding the support for coal in EU member states. Support for the use of oil was also low in the EU. The EB (2006) showed that only 27% of respondents had positive thoughts about oil. Among fossil fuels, gas attracts more support than coal and oil, as 42% of all Europeans were in favor of gas in 2006, whereas in our survey the support for gas was 63%. The overall results showed that, in general, citizens from the Central and Eastern European countries were more supportive of fossil fuels, whereas their wealthier Western European counterparts were more negative.

The material and environmental consequences of fossil fuels challenge citizens and policy-makers to embrace renewable energy sources (Cicia et al., 2012). The results of the EB (2006) showed that Europeans are willing to use solar and wind energy, with 80% of them supporting solar, 71% wind, 65% hydroelectric, 60% ocean energy (tidal/wave/marine currents), and 55% biomass. In our survey, 73% of respondents prefer renewables to fossil fuels, even if they are costlier.

More recent cross-country surveys also demonstrated mass opposition to the use of nuclear energy. The Pew Research Center's Spring 2015 Global Attitudes and Trends survey noted that the majority of respondents in all countries, with the exception of Russia, stated that developing alternative sources, such as wind, solar, and hydrogen technology should be a more important policy priority. The use of nuclear energy, however, created the most public controversy in the

EU. The Eurobarometer 65.3 (EB, 2006) showed that only 20% of Europeans were in favor of using nuclear energy. This low support across the EU indicates that if policy-makers are planning to increase the use of nuclear power, there needs to be “a change in public perception of this source of energy” (Cicia et al., 2012: 59). In our survey, 39.9% of respondents did not support the installation of new nuclear energy plants.

Scholars contend that nuclear accidents “generate a strong signal that there is an unusual risk in nuclear power” and “perpetuate a negative image or stigmatization of nuclear energy” (Kim et al., 2013: 823, Rosa and Dunlap 1994). Moreover, empirical analysis showed that “public acceptance of nuclear energy sharply decreased after the [Fukushima] accident in countries with a high density of nuclear power reactors” (Kim et al., 2013: 827). In our survey, 65.4% of respondents believed that nuclear power plants threaten the environment and public health.

Despite the considerably negative public attitudes toward nuclear energy, the EB (2006) identified that 36% of Europeans viewed nuclear energy as among the three most used energy sources in their country in the last 30 years. In line with expectations, a greater share of respondents stated that solar energy (49%) and wind energy (40%) would be more likely to be used in the future, while 18% mentioned oil and 27% gas as the top sources of the future. Only 8% of respondents cited coal. In our survey, solar was the most preferred energy source of the future (40%), followed by natural gas (22%) and wind (7%).

A recent survey, the Eurobarometer 80.2 (EB, 2013), asked respondents how important it was that their national government set targets to increase the amount of renewable energy used, such as wind or solar, by 2030. In our survey, 73% of Turkish respondents said that they agreed or totally agreed that renewable energy sources should be preferred over fossil fuels. EB (2013) showed that Europeans were also supportive of renewable energy but to a greater extent, with 90% of all Europeans believing that it was important that their governments increase its use. The most support came from Cyprus (83%) and the least from Estonia (31%).

The greater preference for renewable energy might be explained by public perception of the consequences of fossil fuels. The Eurobarometer 83.4 (EB, 2015), for example, asked EU citizens their opinion about climate change. Similar to our results for Turkey (91.3%), 91% of all Europeans viewed climate change as a serious problem. The percentage was highest in Greece (87%) and lowest in Estonia (34%). Likewise, the ISSP's analysis (2012) revealed that 26% of respondents in 32 countries believed that climate change was extremely dangerous and 36% said very dangerous for the environment. The same survey also showed that almost 16% of respondents definitely believed in climate change caused by the use of fossil fuels. In our survey, 33.4% of respondents (to a great extent) considered energy as a major contributor to global warming.

7. Conclusion and suggestions

Energy is by nature full of volatility and uncertainty. Since Turkey is a developing country and depends so much on imports, energy is of great strategic and commercial importance. Turkey should increase its domestic production and consumption of renewable energy and look for alternative countries as import partners. While doing so, public choices should be taken into consideration. Hence, we performed a nation-wide survey to investigate the Turkish public's energy preferences and opinions. A face-to-face survey was conducted with 1204 households from 16 different cities as a representative sample of the Turkish population. This study was the first to investigate the preferences of the Turkish public towards a detailed range of energy issues including: i) energy consumption and preferences of households, ii) public opinion about energy policies, and iii) global energy and environment-related issues. We have compared our results with national, European, or international survey results (whenever possible) to

Table 7
Conformity of government policies with public opinion for various energy issues.

Energy Issue	Public Preferences/Opinion	Government Strategy/Plan	Conformity
Thermal insulation	Only 35% of residential buildings have insulation	25% of all 2010 building stock by 2023	Non-conforming
Oil and gas pipelines & Natural gas supply	Positive opinion on policies (54.5% & 53.9%, respectively)	Two new pipeline projects and new storage will double the supply by 2023	Conforming
Climate change	78% believed in climate change	Further reductions in CO ₂ emissions	Conforming
Renewable energy	Highest support for installation of new wind and solar plants (86.2% and 86.0%, respectively).	Increase in renewable energy capacity and supportive legislation	Conforming
Nuclear energy	Nuclear plants were less favored (54.2%),	Two new nuclear plants by 2023	Non-conforming
Fossil energy	Coal plants were less favored (50.4%).	Supportive legislation in 2016 to promote local coal plants	Non-conforming

identify similarities and differences in findings. The main conclusions from our survey can be summarized as follows:

- The most prevalent expenditure in Turkish household's energy consumption was heating (65%).
- Natural gas was the main energy source for cooking, water heating, and cooktops (over 50%) in Turkish household's energy consumption.
- Electricity and natural gas had the highest monthly bills (50.1% and 38.7%, respectively) with most bills around 100–150 TL for electricity and above 200 TL for natural gas.
- Although a 17% increase from the MENR-GDRE survey in 2010, still 65.2% of the respondents did not have thermal insulation in their homes, which indicates a considerable potential for energy-efficiency savings.
- Electricity and natural gas prices were perceived as expensive by most households (88.0% and 85.6%, respectively).
- Energy (38.0%) and environmental (47.0%) policies of political parties did not affect the voting choices of the households. Although the government's energy policies were mostly supported by people who voted for the ruling party, they were not generally accepted by people who voted for opposition parties.
- Turkish households preferred natural gas (63%) and solar (21%) as energy sources, whereas Europeans were more supportive of solar and wind.
- Energy was not considered amongst the most important problems in Turkey (12.4%).
- Dependence on imported energy (38.6%) and high energy prices (30.8%) were viewed as Turkey's most important energy problems.
- Most Turkish households preferred to import energy from Azerbaijan (42%), followed by Russia (20%).
- The majority of Turkish households believed in climate change (78%), which positively correlated with high income and education levels.
- Solar (40%) and natural gas (22%) were viewed as the most likely energy sources of the future.
- Turkish households supported nuclear energy using domestic technology (56.1%) to reduce energy imports and prices (52.8%), but at the same time were aware of the threats and risks associated with nuclear energy (65.4%).
- Most Turkish households supported local natural gas and oil exploration (67.7%), but they preferred renewables as an alternative to fossil fuels (73%).

Finally, we have conducted a comparative analysis among public preferences and government's energy policies in Turkey and summarized our results in Table 7. Policy-makers can benefit from this type of analysis and shape their energy policies according to public preferences and opinions.

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